land. Mr. W. M. Watts considered that the amount of dew could hardly exceed 1½ inches per annum, and Mr. Barrowman was not aware of the existence of dew-ponds in Scotland. Mr. G. P. Hughes said that dew-ponds were unknown in his district (Berwickshire). He thought they might prove useful in Australia and South Africa, dry countries where the dews were heavy. The Rev. E. P. Knubley noted their existence in Wiltshire, and Prof. H. Louis thought that the exact composition of the water in these ponds was one of the essential points to be examined. Prof. Potter noted the existence of ponds in Warwickshire, Suffolk and the South of Portugal, which he thought might prove analogous to dew-ponds.

Prof. Miall referred to various points which had been raised in the discussion. Ponds to be classed with dew-ponds must not be fed by springs or surface drainage. He had hitherto found that ponds in the Midland counties, supposed to be analogous to dew-ponds, were not really so. He hoped that the corresponding societies would take up the subject.

Section C.—Mr. Monckton, representing Section C, drew attention to the labours of two committees wishing to obtain the co-operation of the corresponding societies in their work, the Geological Photographs Committee and the Erratic Blocks Committee. The secretary of the Geological Photographs Committee was Prof. W. W. Watts; the secretary of the Erratic Blocks Committee Prof. P. F. Kendall.

Section D.—The Rev. E. P. Knubley, representing Section D, was anxious that the corresponding societies should go on observing the migration of birds; also the food-supply of birds and the life-histories of insects.

Section H.—Mr. E. Sidney Hartland, representing Section H, brought before the Conference the work of the Anthropological Photographs Committee. That committee wished to collect photographs of objects of anthropological interest which were now scattered over the country, and almost unknown outside their own localities. They wanted photographs of prehistoric stone monuments and implements, of primitive pottery and of objects connected with local superstitions. The collection would be placed in the rooms of the Anthropological Institute. The secretary of the committee was Mr. J. L. Myres.

The Rev. J. O. Bevan urged the committees of the corresponding societies to lay before their members the desirability of a systematic survey of their counties with respect to their ethnography and ethnology, archæology, folklore, meteorology, botany, ornithology, &c. This kind of work was being done in part at various places. The committee of the British Association which had been concerned with ethnography and ethnology had been dissolved at the Dover meeting. He hoped that the local societies would take up the work, and inform the Corresponding Societies Committee what was being done.

After a few remarks from Mr. Hembry, who suggested that at future meetings sectional matters should be taken before the reading of a paper on any special subject, the meeting came to an end.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The Vice-Chancellor announces that Mr. W. W. Astor has contributed the sum of £10,000 to the University Benefaction Fund.

Mr. F. G. Kenyon, assistant keeper of the manuscripts in the British Museum, has been appointed Sandars Reader in bibliography.

Dr. Haddon, F.R.S., has been appointed University lecturer in ethnology, and Mr. J. J. Lister, F.R.S., to be demonstrator of comparative anatomy.

A University lectureship in experimental physics is vacant by the resignation of Prof. Wilberforce. Applications should reach the Vice-Chancellor by Saturday, November 3.

The portrait of Charles Darwin, now in the Philosophical Library, has been lent for the exhibition of the works of Sir W. B. Richmond, to be held in the New Gallery.

MR. J. A. MCCLELLAND, M.A., has been appointed to the chair of Natural Philosophy in the University College, Dublin, which was rendered vacant by the death of Prof. Preston. Mr. McClelland is a native of North Ireland, and studied physics under Prof. Anderson at Queen's College, Galway. After graduating M.A., he went to Cambridge and continued his studies in physics under Prof. J. J. Thomson, obtaining the B.A. (Research) degree for his original work in the Cavendish Laboratory. In Ireland Mr. McClelland gained an "1837 Exhibition" Science Scholarship, and later a Junior Fellowship of the Royal University of Ireland.

A NOTEWORTHY announcement in the Calendar of University College, Bristol, is that a clinical and bacteriological research laboratory has been established at the college, under the direction of Prof. A. F. Stanley Kent. The value of such a laboratory in a port like that of Bristol cannot be over-estimated, and the City authorities should show their appreciation of it in a practical way. The laboratory will not only provide a means of obtaining trustworthy information and reports upon pathological material, but will also give medical men an opportunity of carrying out bacteriological investigations. Should plague ever appear in Bristol, as it has done at Glasgow, the City authorities will know the value of the laboratory now established at their University College. At present the college does not receive nearly so much local support as some of the other provincial colleges, and there seems to be little hope that there will ever be a West of England University with its centre at Bristol, analogous to the University of Birmingham.

IN the course of her able and suggestive address at the opening of the Passmore Edwards Museum of the Essex Field Club on October 18, the Countess of Warwick made the following statement with respect to local museums:—"I am convinced that museums are destined to play such an important part in education in the future that no town of any importance will be able to be without an institution of this kind. But one of the chief reasons why this part of the club's work has not hitherto been practically realised is because the establishment and maintenance of a museum requires considerable financial resources. However zealous the members of a county natural history society may be, their aims and objects rarely rouse popular enthusiasm to the extent of raising an adequate fund for such purposes. In some counties private munificence had compensated for the lack of public interest. In other cases—and I am glad to be able to quote as an example another Essex town, Colchester—an enlightened Town Council has enabled a local museum to find an appropriate home. And again, in other instances, some of the County Councils have given financial aid from the Technical Instruction Grant, quite a legitimate expenditure as it appears to me, and, if I may express a personal opinion, a most valuable way of assisting in the spread of that knowledge which is the core an essence of all sound scientific education—a knowledge of nature at first hand as distinguished from the knowledge imparted through books or didactically taught in the class-room. But I am afraid that we as a nation have hardly yet risen to that high-water mark of scientific culture which should characterise a great civilisation. I do not mean to imply that we are lacking in scientific ability, that we are devoid of originality, or that we have failed to contribute our share of knowledge to the sum total of human progress. But I fear that the *spirit of modern science* has not sunk into the public mind—it has not permeated the rank and file to that extent which is required by the age in which we live, the century of science *par excellence*. Our purses are ever open, and have always been opened, in the names of charity and philanthropy, religious endowment and missionary enterprise, political organisation and popular sports. But science, upon which the national welfare and our position in the scale of nations ultimately depends, has to go begging for her tens, while thousands are forthcoming for these other objects." These remarks, which were received with loud applause by the audience at West Ham to whom they were addressed, coming from the mouth of a lady who has set such a brilliant example by her pioneering work in rural education, should be productive of good throughout the country. Most cordially will our readers endorse Lady Warwick's sentiments.

SCIENTIFIC SERIALS.

THE *Journal of the Royal Microscopical Society* for October contains a further instalment of Mr. F. W. Millett's paper on recent Foraminifera of the Malay Archipelago; a short article on a new projection eye-piece and an improved polarising eye-piece, by Mr. E. B. Stringer; and the conclusion of Mr. E. M. Nelson's note on the microscopes of Powell, Ross, and Smith, the present instalment dealing with the instruments of

Smith and Beck (now Messrs. R. and J. Beck, Ltd.). In the summary of recent researches in microscopy is an interesting description (with illustrations) of a microscope, with its oculars and objectives, used by Prof. Amici, the discoverer in 1841 of the part played by the pollen-tube in the fertilisation of flowering plants. Nothing could more forcibly illustrate the enormous advance made during the past sixty years in the manufacture of the microscope and its appliances.

Bollettino della Società Sismologica Italiana, vol. vi. 1900-1901, Nos. 2 and 3.—On the necessity and on the choice of comparable seismic apparatus, by A. Cancani (see pp. 395-6).—On the velocity of propagation of the Emilian earthquake of March 4, 1898, by G. Agamennone. The velocity is found to be about 3 km. per second, and it does not vary perceptibly with the distance from the epicentre.—Contribution to the study of the great Neapolitan earthquake of December 1857, by L. Antonio. Contains a copy of a letter written from Caggiano, close to the position assigned by Mallet to the epicentre.—New type of seismometrograph, by G. Agamennone. A reprint of a paper describing an instrument specially designed for registering the very small movements of the ground.—Notices of earthquakes recorded in Italy (March 21 to June 5, 1899), by A. Cancani, the most important being the Greek earthquakes of April 6, 15 and May 3, the Dalmatian earthquake of May 15, and distant earthquakes on March 3, April 2, 12, 13, 16, May 8 and June 5.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, June 21.—"On the Capacity for Heat of Water between the Freezing and Boiling Points, together with a Determination of the Mechanical Equivalent of Heat in Terms of the International Electrical Units." Experiments by the Continuous-flow Method of Calorimetry performed in the Macdonald Physical Laboratory of McGill University, Montreal. By Howard Turner Barnes, M.A.Sc., D.Sc., Joule Student. Communicated by Prof. H. L. Callendar, F.R.S.

At the Toronto meeting of the British Association in 1897, a new method of calorimetry was proposed by Prof. Callendar and the author for the determination of the specific heat of a liquid in terms of the international electrical units. At the Dover meeting in September, 1899, some of the general results obtained with the method for water over a part of the range between 0° and 100° were communicated, with a general discussion of the bearing of the experiments to the work of other observers. In the present paper the author gives a summary of the complete work, in the case of water, to determine the thermal capacity at different temperatures between the freezing and boiling points.

Theory of the Method.

If a continuous flow of liquid in a tube be made to carry off a continuously supplied quantity of heat EC, in electrical units, then after all temperature conditions have become steady

$$Js\rho(\theta_1 - \theta_0)t + (\theta_1 - \theta_0)ht = ECt$$

where

J = mechanical equivalent of heat,
ρ = flow of liquid per second,
s = the specific heat of the liquid,
θ_0 = the temperature of the liquid flowing into the tube,
θ_1 = the temperature of the liquid flowing out of the tube,
h = the heat loss per degree rise of temperature from the liquid flowing through,
t = the time of flow.

In the case of water, E represents the E.M.F. across an electrical heating conductor in the tube, and C the current flowing. In this case, which is treated of entirely in the present paper, Js is replaced by $4{\cdot}2(1 \pm \delta)$ where δ is a small quantity to be determined, and varies with the thermal capacity of the water, which is not exactly equal to 4·2 joules at all points of the range.

Substituting in the general equation, rearranging terms, and dividing through by t, the equation is given in the following form :—

$$4{\cdot}2\rho(\theta_1 - \theta_0)\delta + (\theta_1 - \theta_0)h = EC - 4{\cdot}2\rho(\theta_1 - \theta_0),$$

which is termed the general difference equation of the method. The two terms δ and h may be determined by using two values of Q, giving two equations of the form

$$4{\cdot}2\rho_1(\theta_1 + \theta_0)\delta_1 + (\theta_1 - \theta_0)h = E_1C_1 - 4{\cdot}2\rho_1(\theta_1 - \theta_0)$$
$$4{\cdot}2\rho_2(\theta_2 - \theta_0)\delta_2 + (\theta_2 - \theta_0)h = E_2C_2 - 4{\cdot}2\rho_2(\theta_2 - \theta_0).$$

For the same value of θ_0, if the electrical supply for the two flows is regulated so that $\theta_1 = \theta_2$, then $\delta_1 = \delta_2 = \delta$, and by eliminating h,

$$\delta = \frac{(E_1C_1 - 4{\cdot}2\rho_1(\theta_1 - \theta_0)) - (E_2C_2 - 4{\cdot}2\rho_2(\theta_1 - \theta_0))}{4{\cdot}2(\rho_1 - \rho_2)(\theta_1 - \theta_0)}$$

which corresponds to the mean temperature

$$\theta_0 + \frac{\theta_1 - \theta_0}{2},$$

where $(\theta_1 - \theta_0)$ is not too great.

In the present method the flow tube is of glass, about 2 mm. in diameter, connected to two larger tubes forming an inflow and an outflow tube, in which the temperature of the water is read, by a differential pair of platinum thermometers, before and after being heated by the electric current. A glass vacuum jacket surrounds the fine flow tube and a part of the inflow and outflow tubes, to reduce the heat loss as much as possible. A copper water jacket encloses the inflow tubes and vacuum jacket, in order to maintain the glass surface of the vacuum jacket always at a constant temperature equal to the inflowing water. The heat loss from the water is then the loss due to radiation from the flow tube through the vacuum jacket, and conduction from the ends of the flow tubes.

In testing the accuracy of the method, the dependence of the heat loss on the rise of temperature was found, and the dependence of the heat loss on the flow.

The results with different calorimeters and with different rises of temperature are given in the following table :—

Summary of the Specific Heat of Water from Smoothed Curve.

Temperature C.	δ	J.
5	+ 0·00250	4·2105
10	+ 0·00050	4·1979
15	− 0·00250	4·1895
20	− 0·00385	4·1838
25	− 0·00474	4·1801
30	− 0·00523	4·1780
35	− 0·00545	4·1773
40	− 0·00545	4·1773
45	− 0·00520	4·1782
50	− 0·00480	4·1798
55	− 0·00430	4·1819
60	− 0·00370	4·1845
65	− 0·00310	4·1870
70	− 0·00245	4·1898
75	− 0·00180	4·1925
80	− 0·00114	4·1954
85	− 0·00043	4·1982
90	+ 0·00025	4·2010
95	+ 0·00090	4·2038
	Mean value.....	4·18876

The values of δ represent the specific heat of water in terms of a thermal unit equal to 4·2000 joules, which occurs at 9° C. It is more suitable to select a thermal unit at a more convenient part of the scale. The mean value of the mechanical equivalent of heat from these measurements over the whole range is 4·18876 joules, which is very nearly equal to the value at 16° C., which is 4·1883 joules. It seems desirable to select a unit at a temperature which, if at the same time at a convenient part of the scale, may be equal to the mean value over the whole scale. The author has in consequence adopted a unit at 16° C., and has expressed the specific heat of water in terms of this unit.

Two formulæ can be fitted very accurately over the scale. Between 5° and 37·5° C. the following expression in terms of a thermal unit at 16° is found to read,

$$S = 0{\cdot}99733 + 0{\cdot}0000035(37{\cdot}5 - t)^2 + 0{\cdot}00000010(37{\cdot}5 - t^3).$$

The same formula holds between 37·5° and 55° by simply considering all values of the cubical term positive. Above 55° the simple formula

$$S = 0{\cdot}99850 + 0{\cdot}000120(t - 55°) + 0{\cdot}00000025(t - 55)^2$$

holds with great accuracy.

Physical Society, October 26.—Dr. Lodge, President, in the chair.—The chairman read a letter from Prof. Cleveland Abbe, of the United States Coast and Geodetic Survey, stating that the *Monthly Weather Review* would be sent regularly to any member of the Physical Society expressing a wish to receive